Small Business Innovation Research/Small Business Tech Transfer

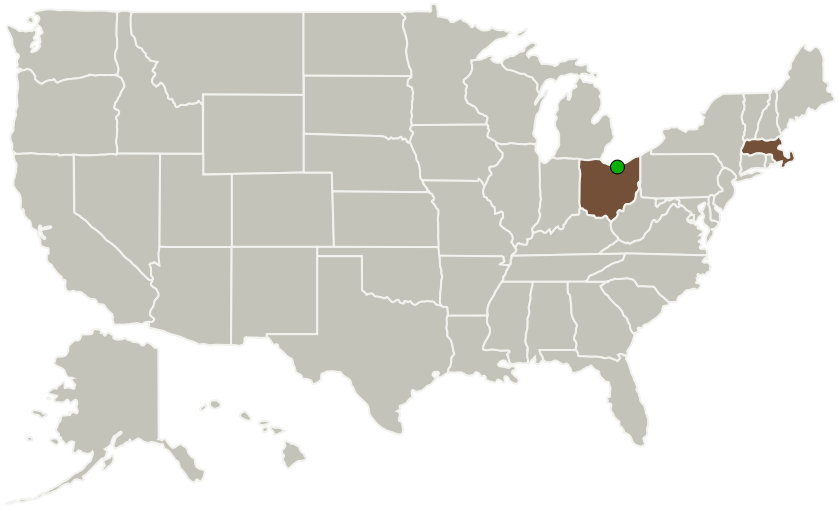
A Two-Stage Waste Gasification Reactor for Mars In-Situ Resource Utilization, Phase I

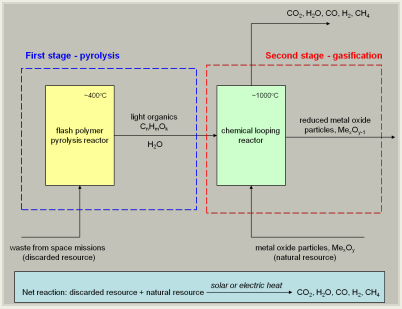
Completed Technology Project (2013 - 2013)

Project Introduction

We propose to design, build, and test a two-stage waste processing reactor for space applications. Our proposed technology converts waste from space missions into hydrogen, water, carbon monoxide, carbon dioxide that can be used for energy production and/or life support. This innovative reactor technology employs a pyrolysis reactor as the first step, followed by a chemical looping gasification reactor as the second step. The two-stage process is more suitable than the traditional one-step gasification process, because solid residues associated with the waste, such as ash and tar, are contained in the pyrolysis unit. The utilization of metal oxides that can be readily obtained at the site of exploration as an oxidizer in the gasification (second) step instead of traditional oxidizers such as oxygen or steam further saves the valuable resources that can be used for life support systems or other space applications. If successful, our innovation can fully utilize natural (metal oxides) and discarded (wastes from space missions) materials that may exist during space exploration, thus saving the valuable oxygen or water that can be used for life support systems or other space applications.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Aerodyne Research, Inc	Lead Organization	Industry	Billerica, Massachusetts
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Transitions

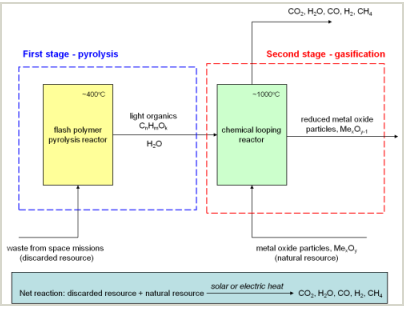
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137929)*

Images



Project Image
A Two-Stage Waste Gasification Reactor for Mars In-Situ Resource Utilization
(https://techport.nasa.gov/image/127850)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Aerodyne Research, Inc

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

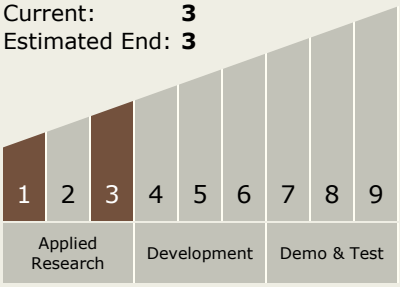
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Hsi-wu Wong

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.2 Mission Infrastructure, Sustainability, and Supportability
    - TX07.2.1 Logistics Management

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System